

REMARKS

Please reconsider the application in view of the above amendments and the following remarks. Applicant thanks the Examiner for carefully considering this application.

Disposition of Claims

Claims 1 and 4-9 were pending in this application. Claims 6 and 9 were cancelled by this reply. Thus, claims 1, 4-5 and 7-8 are now pending in this application. Claim 1 is independent. The remaining claims depend directly from claim 1.

Claim Amendments

Claims 1 and 8 were amended by this reply to clarify the present invention. No new matter has been added by this reply.

Rejection(s) under 35 U.S.C. § 103

Claims 1 and 5-9 were rejected under 35 U.S.C. § 103(a) as being obvious over JP 09330947 ("JP '947") in view of JP 07082533 ("JP '533") and U.S. Patent No. 5,872,194 issued to Isshiki ("Isshiki"). To the extent this rejection still applies to the claims as amended, the rejection is respectfully traversed.

JP '947 discloses a method of producing an electrical device comprising arranging an adhesive layer containing a curable resin and electrically conductive particles (added to the adhesive at the outset) on a first electrode of a first object, arranging an adhesive layer on a second electrode of a second object, positioning the first and second electrodes in register with each other, and with the first and second object facing each other, tightly connecting the adhesive layer on the first object to the adhesive layer on the second object,

thrusting the first and second objects against each other to interconnect the first and second electrodes via the electrically conductive particles, and allowing the curable resin to be polymerized by heating. JP'947 discloses a thermosetting resin composed of the curable resin and the adhesive.

JP '533 discloses arranging an adhesive layer containing one or both of a silane coupling agent having a heat curable alicyclic epoxy group and an alicyclic epoxy resin on one adhesive surface, arranging an adhesive layer containing a curable adhesive composition including a cationic thermal polymerization initiator on the other adhesive surface, thrusting the two objects against each other with the adhesive layers therebetween, and curing the heat curable alicyclic epoxy resin by cationic thermal polymerization. Additionally, JP '533 discloses a sulfonium salt as a cationic thermal polymerization initiator, and allowing the epoxy resin to be cationic polymerized by heating.

Isshiki discloses organic aluminum chelates and organic sulfonium salts as curing catalysts used with silanol-terminated diorganosiloxane as curing agents for curing epoxy resins which are dispersed in a polysiloxane composition.

On the other hand, claim 1 of the present application recites a method for producing an electrical device made up by a first object for bonding including a first electrode and a second object for bonding including a second electrode to be connected to said first electrode, by bonding said first object for bonding and said second object for bonding to each other, comprising the steps of:

- arranging an adhesive, mainly containing a thermosetting resin and a silane coupling agent as a first curing agent, at least on said first electrode, to form an

adhesive layer, wherein electrically conductive particles are added to said adhesive from the outset;

- arranging a second curing agent, reacted with said first curing agent by heating to polymerize said thermosetting resin, at least on said second electrode, to form a layer of the second curing agent, said second curing agent being mainly composed of one or both of an aluminum chelate and an aluminum alcoholate;
- positioning said first and second electrodes in register with each other;
- tightly contacting said adhesive on said first object for bonding with said second curing agent on said second object for bonding; and
- thrusting and heating said first and second objects against each other for bonding to develop a cation by reaction of said silane coupling agent as a main component of said first curing agent and one or both of said aluminum chelate and said aluminum alcoholate of the second curing agent and for interconnecting said first and second electrodes through said electrically conductive particles and allowing said thermosetting resin to be cationically polymerized by heating.

Thus, according to claim 1, the first curing agent mainly composed of the silane coupling agent and the second curing agent mainly composed of one or both of the aluminum chelate and aluminum alcoholate are arranged on separate objects for subsequent bonding. Therefore, the silane coupling agent and one or both of the aluminum chelate and aluminum alcoholate do not react and generate cations until the first and second objects are thrust together and heated. Because of this separation, cationic polymerization of the thermosetting resin does

not occur until the objects are brought together, thereby maintaining long shelf life and high adhesion intensity.

As demonstrated in examples 1-4 of the present application, the cured adhesive possesses high peel strength due to the separation of the first and second curing agents on the objects for bonding, whereas such high peel strength does not result in comparative examples 1 and 2, which combined the first and second curing agents in the adhesive layer, is low so as not to be able to bear practical use.

Further, according to the present application, by generating cations by reaction of the silane coupling agent (as the main component of the first curing agent) with one or both of the aluminum chelate and aluminum alcoholate (as the main component of the second curing agent), the thermosetting resin is cationically polymerized at a lower temperature and for a shorter time than with a conventional adhesive.

None of JP '947, JP '533, or Isshiki teach or suggest such features claimed in claim 1, nor the effects which advantageously result from such claimed features. The Examiner asserts that it would have been obvious to generate curing components by reaction between a silane coupling agent and aluminum chelate, as in the present application, by applying JP '533 and Isshiki to JP '947.

However, as mentioned above, JP '947 simply discloses use of first and second objects for bonding with a curable resin on one object and adhesive layer on the second. JP '947 does not teach or suggest separating two curing agents on the two objects, which generate cations upon reaction to trigger cationic polymerization of a thermosetting resin.

Rather, the Examiner cites JP '533 as teaching separation of two curing agents on a first and second object. However, Applicant respectfully notes that this interpretation of JP '533 is misplaced. In fact, JP '533 discloses arranging an adhesive layer containing one or both of the silane coupling agent and epoxy resin on one object, and arranging a cationic thermal polymerization initiator and curable adhesive composition (*i.e.*, resin) on the other object. The silane coupling agent provided in JP '533, is not a curing agent in the sense that it does not promote or control a curing reaction. Rather, the silane coupling agent, as taught by JP '533, is simply an adhesion promoter, to improve the adhesive properties of the adhesive surface. Curing occurs despite the presence or absence of the silane coupling agent (as demonstrated in the Examples of JP '533), and thus, the silane coupling agent is not used as a curing agent in JP '533, specifically to generate cations upon reaction with aluminum chelate or alcoholate to trigger or initiate polymerization. Rather, JP '533 simply discloses use of a cationic thermal polymerization initiator (sulfonium salt) on an adhesive surface which triggers (on its own) polymerization of a resin upon heating. Because the sulfonium salt may be combined with the resin, polymerization may occur before thrusting and heating, decreasing the shelf life of the adhesive.

On the other hand, according to the present application, the silane coupling agent and aluminum chelate and/or alcoholate are separated do not react and generate cations before thrusting and heating, and polymerization does not occur until cations are generated. Therefore, because polymerization is not be initiated by only one of the curing agents, polymerization only occurs after thrusting and heating of the two objects on which the two curing agents are separated, providing longer shelf life than the adhesive disclosed in JP '533.

The Examiner cites Isshiki as teaching an aluminum chelate, as well as organic sulfonium salt, as a curing agent for curing an epoxy resin. The techniques disclosed in Isshiki include a matrix of a liquid polysiloxane curable composition in which a liquid organic resin composition is dispersed, the organic resin composition formed with an epoxy resin, a silanol-terminated siloxane oligomer (as a curing agent for the epoxy resin), and a curing catalyst (including aluminum compounds, and sulfonium salts), which is heat curable by a silanol-epoxy ring opening reaction. The presence of the aluminum or other catalyst preferentially drives the silanol-epoxy ring opening, rather than a silanol-silanol condensation. Indeed, when comparing the relative amounts of epoxy, silanol-terminated siloxane, and aluminum or sulfonium compound, it is clear that the first two components are intended to react together while the third component, the aluminum or sulfonium compound, is acting as a catalyst and not a reactant. Thus, the cure mechanism of Isshiki is completely different from the present application, in which curing agents (silane coupling agent and aluminum chelate and/or alcoholate) separated on two objects react upon contact to generate cations, triggering polymerization of an epoxy resin by cationic polymerization. Moreover, in view of the relative reactivity of silanol terminal groups, one skilled in the art would appreciate that the epoxy and silanol-terminated group of Isshiki would have some level of premature reaction, thus indicating the instability of these two components being provided together in an adhesive layer, as required by the present application.

The Examiner asserts that it would have been obvious to substitute the sulfonium salt of JP '533 with the aluminum chelate of Isshiki, because "aluminum chelate [] was a known heat activated latent hardener that is functionally equivalent to sulfonium salt as shown by Isshiki." Applicant respectfully asserts that the fact that an aluminum compound and sulfonium compound are both mentioned as being catalysts to preferentially drive a silanol-epoxy ring

opening over a silanol-silanol condensation does not necessarily mean that one skilled in the art would be motivated to replace the sulfonium salt of JP '533 with an aluminum compound, where the sulfonium salt, as a cationic initiator, in JP '533 rearranges intermolecularly to form a Bronsted acid, which then releases a cation, which triggers polymerization of the epoxy resin. One skilled in the art would appreciate that the aluminum compounds and sulfonium salts are *not* equivalent in this respect. Aluminum compounds (and sulfonium compounds), as used by Isshiki preferentially drive a silanol-epoxy ring opening over a silanol-silanol condensation, whereas sulfonium compounds, as used in JP '533, intermolecularly rearrange to release cations trigger epoxy cure. Thus, one skilled in the art, in reading JP '533 and Isshiki, would not be motivated to substitute the sulfonium salt with an aluminum chelate because he would have no expectation of success that polymerization would occur.

According to the Examiner's broad assertions, his proffered combination of JP '947, JP '533, and Isshiki, would suggest "bringing into contact an epoxy resin, silane coupling agent, and aluminum chelate... *is consistent with and in agreement with that claimed and disclosed by applicants resulting in reaction* of the silane coupling agent and aluminum chelate to develop a curing component which component polymerizes the epoxy resin such that one of ordinary skill would readily expect that [the system] taught by JP '947 as modified by JP '533 and Isshiki to react the same absent a showing otherwise." Applicant reminds the Examiner of the following points shown above: 1) that the sulfonium salt *alone* in JP '533 triggers cure likely by intermolecular rearrangement to form a Bronsted acid; 2) while sulfonium salts and aluminum compounds may be treated as equivalents for catalyzing the silanol-epoxy ring opening cure in Isshiki, one skilled in the art would appreciate that they would not behave in equivalent manners under the cationic epoxy polymerization cure set forth in JP '533; and 3) that

the silane coupling in JP '533 is simply an adhesion promoter, and cure occurs regardless of its exclusion as shown by the Examples in JP '533.

In view of these points and the above discussion, Applicant submits that the Examiner's rationale for the proffered combination instead must be motivated by the teachings of the present application, as in fact hinted at by the Examiner, as nowhere in any reference cited by the Examiner is there any teaching or suggestion of a reaction between a silane coupling agent and an aluminum chelate and/or alcoholate to generate cations and trigger polymerization upon thrusting and heating. Rather, only the present application shows a premise for keeping the silane coupling agent separated from the aluminum chelate / alcoholate so that upon thrusting together and heating, reaction between the silane coupling agent and aluminum chelate and/or alcoholate may occur to generate cations and trigger polymerization.

Applicant reminds the Examiner that use of the present application as a "road map" for selecting and combining prior art disclosures is wholly improper. See MPEP § 2143; *Interconnect Planning Corp. v. Feil*, 774 F.2d 1132 (Fed. Cir. 1985) (stating that "[t]he invention must be viewed not with the blueprint drawn by the inventor, but in the state of the art that existed at the time"); *In re Fritch*, 972 F.2d 1260 (Fed. Cir. 1992) (stating that "it is impermissible to use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious This court has previously stated that 'one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.'"); *In re Wesslau*, 353 F.2d 238 (C.C.P.A. 1965) (stating that "it is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given

position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art").

Thus, because JP '947, JP '533, and Isshiki, whether considered alone or in combination, teach or suggest separation and subsequent reaction between a silane coupling agent and an aluminum chelate and/or alcoholate on two objects to generate cations and trigger polymerization of a resin upon thrusting and heating of the two objects, claim 1 is patentable in view of JP '947, JP '533, and Isshiki. Dependent claims are patentable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Claim 4 is rejected under 35 U.S.C. § 103(a) as being obvious over JP '947, JP '533, Isshiki, as applied to claim 1 above, and further in view of either one of U.S. Patent No. 4,772,672 to Isozaki ("Isozaki") or JP 07011152 ("JP '152"). This rejection is respectfully traversed.

As shown above, claim 1 is patentable over JP '947, JP '533, and Isshiki. Isozaki and JP '152, which the Examiner cites as teaching the claimed aluminum chelate, do not provide that which JP '947, JP '533, and Isshiki lack with respect to independent claim 1. Thus, independent claim 1 is patentable over JP '947, JP '533, Isshiki, Isozaki, and JP '152. Dependent claims are patentable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Claims 5-6 are rejected under 35 U.S.C. § 103(a) as being obvious over JP '947, JP '533, Isshiki, as applied to claim 1 above, and further in view of JP 09067427 ("JP '427"). This rejection is respectfully traversed.

As shown above, claim 1 is patentable over JP '947, JP '533, and Isshiki. JP '427, which the Examiner cites as teaching a silane coupling agent having an alkoxy group and epoxy ring, do not provide that which JP '947, JP '533, and Isshiki lack with respect to independent claim 1. Thus, independent claim 1 is patentable over JP '947, JP '533, Isshiki, JP '427. Dependent claims are patentable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Conclusion

Applicant believes his reply is fully responsive to all outstanding issues and places this application in condition for allowance. If this belief is incorrect, or other issues arise, the Examiner is encouraged to contact the undersigned or his associates at the telephone number listed below. Please apply any charges not covered, or any credits, to Deposit Account 50-0591 (Reference Number 17155/003001).

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Respectfully submitted,

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Attachments